FIRST YEAR REPORT FOR NASW-5031

Study of the Solar Wind Interaction with Mars

This is the first year report for NASW-5031. It details the progress made during the first four months of the contract in accordance with the contract requirements. The items to be performed according to the proposal were:

1. Implement the HALFSHEL code on the parallel machines at NASA Ames' NAS facility.

2. Perform test simulations of "bare" Mars object and compare results with data and previous simulations that only reached to the Martian terminator.

3. Place ion production chemistry into the parallel HALFSHEL code and test.

4. Simulate Mars at least 3 Rm into the tail region and compare the results to data.

5. Examine the changes in the Martian magnetosphere by examining time dependent variation of the solar wind parameters.

During the first two months the HALFSHEL code was converted to run on the IBM SP-2 parallel machine at NASA Ames' NAS facility. This conversion took longer than expected due continual system upgrades. At the time of the two month progress report the system was down for major upgrades of hardware and operating system by IBM. This upgrade was to take 2 weeks. It took almost 6 weeks for the system to be really usable. The "upgrades" turned out to be major changes in the system that necessitated a complete change in the data management of the HALFSHEL code and the finding of a large number of bugs in their system installation. This coupled with the loss of technical support due to the government furloughs has resulted in less progress on this effort than I would have believed.

However, progress was made and some changes in effort became obvious. One of the changes is the conversion of the code to spherical geometry. It was found in preliminary testing that the ionospheric models could be be more accurately implemented in this geometry than in cartesian geometry. I will now have both geometries available. One of the two manuscripts mentioned in the two month report have been significantly changed from its earlier form based on some new simulations and further research and comparison to data. The manuscript concerning the solar wind deposition is also being expanded based on some discussions with scientists active in the Phobos-2 data analyses. At this point the new manuscripts are undergoing final editing and the creation of better graphics. Finally, during this period a paper on the work was presented at the Fall AGU meeting.

In summary, the first item on the list of objectives has been completed. The second item is completed. Portions of the fourth and five items have been started but will be accomplished in total once the ion production chemistry is in place. Due to the loss of the NAS SP-2 system and its subsequent instability, the ion production chemistry is still in a testing phase and is not in a state yet where one can perform reliable simulations. This is the first item to address in the second year

of the effort. Overall considerable progress was made but the effort required more computer science effort than originally planed due to the changing nature of the NAS SP-2. However, there is good news in that the new configuration of hardware and software plus the inherent configuration of the system has resulted in running speeds of HALFSHEL that are as much as ten times faster than on the CRAY-C90, and the potential for further increases in speed. This means that better resolution, and more physics can be included in the simulations with the code producing reasonable results in a timely manner.